

# The Amsterdam Alexithymia Scale: Its Psychometric Values and Correlations with Other Personality Traits

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## Key Words

Alexithymia · Amsterdam Alexithymia Scale · Reliability and validity · Emotional capacity · Cognitive capacities · Social inadequacy · Gender differences · Personality traits

## Abstract

**Background:** This article describes the construction and validation of the Amsterdam Alexithymia Scale (AAS) and explores some of the nomological net of alexithymia. **Methods:** Four correlational studies are presented. The internal structure of the AAS is explored by factor analyses on items. Correlations of the AAS with sex and (Guilford) intellectual abilities are established. Mean scores of three different professional groups are compared. Correlations between the AAS and several clinical and personality scales are determined. Students served as subjects in all studies ( $347 < n < 559$ ). **Results:** The 20-item AAS has a stable 5-factor structure, covering 5 defining features of alexithymia: difficulties in, respectively, experiencing emotions, fantasizing, analyzing emotions, differentiating between emotions and verbalizing emotions. The AAS showed to be reliable. The AAS

scores were independent of verbal and nonverbal IQ. As expected, the AAS scores turned out to be significantly lower in a group of dramatic art students and significantly higher in a group of math and artificial intelligence students, when compared to psychology students. The AAS scores correlated negatively with extroversion, positively with social inadequacy and not with neuroticism. Finally, correlations between the AAS and the Adjective Check List scores indicated that alexithymia is associated with, respectively, a neglect of own needs and impulses, a reduced capability to understand social situations and a tendency to stick to rules rigidly, to flee into social isolation, to be submissive, to avoid commitment and to experiences of lack of personal meaning in life. **Conclusion:** The AAS is the first instrument measuring the 5 defining features of alexithymia reliably and validly.

## Introduction

As early as the late forties, MacLean [1] described that, in a large proportion of patients with psychosomatic complaints, the emotional experience does not reach the stage

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0033-3190/99/0685-0241\$17.50/0

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of full conscious symbolic and verbal elaboration, resulting in problems during psychoanalysis-based therapy [2, 3]. Sifneos [4] introduced the word alexithymia to describe this phenomenon. Since then, the alexithymia concept has established for itself a place in the literature [5], and alexithymia has been described in drug addicts, patients with alcohol dependence, victims of sexual abuse and persons suffering from posttraumatic stress disorder [6–10]. It has further been assumed that alexithymia enhances the risk for psychosomatic complaints [4, 11, 12], and many publications claim a relation between them [4, 13–21].

Various alexithymia scales have been published. The first one was the 'Beth Israel Hospital Questionnaire' (BIQ) [4]. The reliability of this 17-item test, of which 8 inquire about alexithymia, varies between 0.76 and 0.89 according to Sifneos [4]. However, this test is not a self-evaluation questionnaire and has to be filled out by the therapist, after interviewing the client. The BIQ is therefore time consuming [22], and the reliability of the test varies with the knowledge and experience of the therapist [23].

Six items, inquiring about the client-induced feelings in the therapist were added in a later version of the BIQ [24]. In the same publications, the authors present a self-evaluation alexithymia questionnaire with open questions, which have to be evaluated by the therapist. However, no psychometric data are added in the publications and the same is true for the 'Alexithymia-Provoked Response Questionnaire' [6, 25, 26].

Four self-evaluation alexithymia questionnaires with closed-response formats have been published: (1) the Schalling-Sifneos Personality Scale (revised) [24, 27, 28], (2) the MMPI-Alexithymia Scale (MMPI-AS) [22], (3) the alexithymia scale of Noël [29] and (4) the Toronto Alexithymia Scale (TAS) [27]. Later studies demonstrated that the first two scales mentioned have a low reliability and correlate weakly with the BIQ. Further, the MMPI-AS items lack face validity [6, 24, 26, 30–35].

The Noël questionnaire [29] consists of 12 items, loading on 3 factors which together explain 46.7% of the variance. However, 5 of the 12 items load on more than 1 factor and in such a way that they load positively on one and negatively on the other factor. This questionnaire has never received real acceptance. For more information concerning this issue the reader is referred to Taylor and Bagby [26].

Three versions of the TAS have been published: the TAS [27], the TAS-R [36] and the TAS-20 [37]. Although there are clear differences between these versions, all have

a relatively high reliability and their validity has been demonstrated in various studies. The renewed interest in the subject of alexithymia during recent years is therefore largely owed to the work of Taylor and his coworkers who, by presenting their questionnaires, opened this field for wide-scale research. The factor structure varies between the various versions of the TAS, which have, respectively, 4, 2 and 3 factors. The final version consists of 20 items, has an internal reliability of 0.81 and a retest reliability of 0.77. The 3 factors, however, explain together only 31% of the variance. These 3 factors are labeled as: (1) difficulty in identifying feelings, (2) difficulty in describing feelings and (3) externally oriented thinking [38]. Since Taylor et al. [27] described alexithymia in the introduction of their 1985 article as being characterized by 5 features, it has to be concluded that their scale does not cover the alexithymia concept fully. It has to be concluded therefore that, although it has been demonstrated that the scores on TAS-20 correlate negatively with those on a scale for openness to fantasy as well as with those on a scale for openness to feelings [39, 40], the abilities to experience emotional feelings and fantasies are still not represented as separate factors by their scale. In addition, the items are unevenly distributed over the 3 factors, so that the various factors contribute unequally to the total alexithymia score. Moreover, only 5 of the 20 items are formulated positively, making the questionnaire vulnerable to response tendencies. The TAS has also been criticized by others [41].

This article gives an account of four studies with the Amsterdam Alexithymia Scale (AAS), a 20-item self-evaluation alexithymia scale, with a 5-point response format, ranging from 'very applicable' to 'not applicable at all'. Some results concerning the affirmative validity of the AAS have already been published before by Vingerhoets et al. [42].

The first two studies concern the factor structure, reliability of the scale, and the correlations with sex and intellectual abilities. The third study concerns the AAS scores in three different populations of which it could be expected that they would differ on alexithymia. The last study concerns the correlations between alexithymia and other personality traits.

## **Studies One and Two**

### *Introduction*

The aim of these studies was to examine the factor structure, internal reliability of the AAS, sex differences and association with intellectual abilities.

## Methods

**Subjects.** Three hundred and seventy-nine first-year psychology students (64% females) participated in the first study, and 467 (69% females) first-year psychology students participated in the second study 1 year later. Since not all students filled out all tests correctly, the number of subjects varies slightly over the various analyses, ranging from 357 to 379 in the first study and from 410 to 467 in the second study.

**Development of the AAS.** Originally, we started with a large number of new items and elaborations of some of the Dutch translations of some TAS and Noël-Rimé items. These items were selected in such a way that on face validity, the items would fall into one of the following 5 categories only: (1) experiencing emotional feelings, (2) verbalizing emotions, (3) differentiating between emotions, (4) analyzing emotions and (5) fantasizing. These categories were chosen because they cover more or less fully the alexithymia descriptions as presented in Taylor et al. [27] and Hendryx et al. [43], with the exception of externally oriented thinking or 'pensée opératoire', which was replaced by analyzing emotions. However, this difference is more a difference in words or labels than a difference in concepts. Pensée opératoire or externally oriented thinking stands for the tendency to avoid reflections about emotions, which by default results in a 'preoccupation' with daily prosaic and nonemotional issues.

During a process of 3-factor analytic studies, the items mentioned above were rewritten and split up into more than one item if they were loading on more than 1 factor, or rewritten or replaced if their factor loading was below standards, or rewritten if the number of positively and negatively formulated items was severely out of balance on a particular factor. This process finally resulted in 20 items of which it had to be expected that they would load on 5 factors, 4 items for each factor. The 5 expected factors could be described as: (1) difficulties in experiencing emotional feelings, (2) difficulties in verbalizing emotions, (3) difficulties in differentiating between various emotions, (4) difficulties in analyzing emotions and (5) difficulties in fantasizing. The two studies to be described here are based on these 20 items.

**Tests for Intellectual Abilities.** Intellectual abilities were assessed by 6 ability tests, representing different intellectual skills. The test battery included tests for: (1) vocabulary (difficult word meanings, measuring cognition of semantic units), (2) verbal analogies (items taking the form of e.g. foe: harmed = friend: ....?, measuring cognition of semantic relations), (3) conclusions (linear syllogisms, measuring cognition of semantic systems), (4) number series (requiring the continuation of numerical series, measuring cognition of symbolic systems), (5) number speed (simple arithmetic problems of addition, subtraction, multiplication and division, measuring convergent production of symbolic implications) and (6) embedded figures (discrimination of figures in complex line patterns, measuring convergent production of figural transformations) [44]. The unweighted sum of scores on the 6 tests mentioned above are IQ equivalent [45].

**Statistics.** Orthogonal factor analyses of 5 fixed factors with varimax rotation and Kaiser normalization were applied to the 2 sets of AAS item scores. The internal reliability in the 2 data sets was determined by the Cronbach alpha. Differences between the sexes in mean alexithymia scores were analyzed by Student t test. Correlations between scores for intellectual abilities and scores on the AAS were calculated by Pearson's correlation coefficient.

## Results

**Factor Analyses.** Factor analyses in both studies yielded essentially the same results and provided the expected factors, as indicated in table 1.

The factor results confirmed the expectations, and the factor structure turned out to be stable. Although the total amount of variance explained by the scale remained constant, a shift was noticed in the amount of variance explained by the various factors. In the first study, the factor 'difficulties in differentiating between emotions' explained 16.4% of the variance, 'difficulties in fantasizing' 15.3%, 'difficulties in analyzing' 9%, 'difficulties in experiencing emotional feelings' 8% and 'difficulties in verbalizing' 6.3% (in total 55% was explained), whereas the respective percentages in the second study were: 7.75, 14.7, 7.4, 8.3, 17.5 and 55.6%.

**Item Rest-Test Correlations.** The mean item rest-test correlation in the first study was 0.28, and only 2 items correlated below 0.20 with the rest of the test. The value in the second study was 0.29, again 2 items had item-rest values lower than 0.20. However, since the items are meant to measure 5 independent subscales, the item rest-test correlations should be considered within the subscale concerned. Within subscales, all item-rest-subscale correlations in both studies above were 0.20, whereas the mean item-rest-subscale correlations in both studies were 0.48.

**Correlations between Subscales.** The Pearson correlations between the subscales are presented in table 2. As expected, based on the orthogonal factor analyses, only moderately low correlations between the subscales were found.

**Reliability.** In the first study, the Cronbach alpha for the 20-item test turned out to be 0.70, and those for the 4-item subtests were: difficulties to differentiate between emotions 0.65, difficulties to fantasize 0.81, difficulties to analyze emotions 0.60, difficulties to experience emotions 0.61 and difficulties to verbalize emotions 0.75. Respective values in the second study were: 0.72, 0.64, 0.83, 0.49, 0.55 and 0.82.

The reliability for some subscales (differentiating, analyzing and experiencing emotions) was below acceptable standards. Further research was therefore done with the total 20-item scale only.

**Sex and AAS Scores.** On the average, females scored slightly lower on the AAS than males in both studies. Study 1: mean males 45.11 (SD 8.5), females 43.51 (SD 8.42), t value 1.74, two-tailed p value 0.08. Study 2: males 44.56 (SD 8.6), females 42.57 (SD 8.6), t value 2.27, two-tailed p value 0.02.

**Table 1.** Factor structure of the ASS

	Study one					Study two				
	FA	FB	FC	FD	FE	FA	FB	FC	FD	FE
FA1	+0.72					+0.70				
FA2	-0.62					-0.67				
FA3	-0.64					-0.61				
FA4	+0.70					+0.73				
FB1		-0.79					-0.85			
FB2		+0.85					+0.87			
FB3		-0.69					-0.65			
FB4		+0.82					+0.87			
FC1			+0.53					+0.30	+0.45	
FC2			-0.77					-0.68		
FC3			+0.72					+0.72		
FC4			+0.62					+0.66		
FD1				+0.76					+0.71	
FD2		-0.37		-0.55					-0.54	
FD3				-0.60					-0.55	
FD4				+0.71					+0.71	
FE1					+0.81					+0.79
FE2					-0.78					-0.82
FE3					+0.68					+0.82
FE4					-0.52				-0.30	-0.69

Factor loadings as found in the two studies. Factor loadings <0.30 are not presented. FA = Inability to differentiate between various emotions. 'If I am out of sorts, then I know whether I am fearful or angry.' FB = Inability to fantasize or to daydream. 'Before I fall asleep, I fantasize about various events, encounters or conversations.' FC = Inability to analyze emotions. 'I just wait and see what happens, without the need to understand why.' FD = Inability to experience emotional feelings. 'If I see somebody cry terribly, I remain unmoved.' FE = Inability to verbalize emotions. 'I find it difficult to verbalize my feelings.'

*Correlations with Intellectual Abilities.* All correlations with intellectual abilities were extremely low in both studies. The following correlations were found in the first study: alexithymia and vocabulary -0.035 (mean vocabulary score 18.9, SD 6.0); alexithymia and verbal analogies 0.008 (mean analogy score 24.4, SD 4.9); alexithymia and conclusions 0.057 (mean conclusion score 18.4, SD 6.7); alexithymia and number series 0.094 (mean number series score 12.6, SD 3.3); alexithymia and number speed 0.049 (mean speed score 21.5, SD 9.0); alexithymia and embedded figures -0.052 (mean figure score 12.1, SD 6.4).

The comparable values in the second study were: vocabulary  $r = 0.058$  (mean 26.0, SD 7.8); verbal analogies  $r = -0.034$  (mean 24.3, SD 4.8); conclusions  $r = -0.051$  (mean 19.3, SD 7.0); number series  $r = 0.000$  (mean 12.9, SD 3.8); embedded figures  $r = -0.101$  (mean 11.4, SD 7.0).

### Study Three

#### Introduction

In order to test the validity of the AAS, it was examined whether the AAS would differentiate between three different professional groups of which it had to be expected that they would differ in the probability of alexithymia, since the various professions require different levels of emotional capacities.

#### Methods

*Subjects.* Three hundred and eighty-two psychology students (64% females), 49 academy of dramatic art students (50% females) and 128 math and artificial intelligence students (16% females) participated in this study. All three groups consisted of first-year students. Since different levels of emotional capacities are required for the three professions for which the three educational programs prepare, it was expected that alexithymia scores would be lower in the

**Table 2.** Pearson correlations between subscales

	Diffe	Fanta	Verb	Expe
Differentiating emotions				
Fantasizing	-0.13/-0.05			
Verbalizing emotions	0.38/0.32	-0.05/-0.03		
Experiencing emotions	0.02/0.14	0.24/0.37	0.20/0.22	
Analyzing emotions	0.11/0.13	0.05/0.06	0.22/0.18	0.14/0.16

Correlations before correspond to the first study (n = 379), those behind correspond to the second study (n = 467).

**Table 3.** Differences between professional groups of which it may assumed that they differ in probability for alexithymia

	Mean AAS-20 score	SD	Difference with psychology students		
			range	t	p (two-tailed)
Psychology students	44.04	8.4	22-66		
Drama students	41.45	7.5	25-60	2.046	<0.005
Math and artificial intelligence students	49.80	9.4	29-75	6.4724	<0.005

population of drama students and higher in the population of math and artificial intelligence students, when compared to fresh-year psychology students.

*Measurement.* All subjects filled out the AAS.

### Results

The results of the comparisons between groups are presented in table 3.

As expected, the scores for alexithymia turned out to be significantly lower in the group of academy of dramatic art students and significantly higher in the group of math and artificial intelligence students when compared to the psychology students.

## Study Four

### Introduction

The aim of this study was to explore the nomological network of alexithymia by calculating correlations between alexithymia and other personality features.

### Methods

*Subjects.* Three hundred and seventy-four fresh-year psychology students (64% females) participated in this study, and filled out the AAS and 4 different personality trait scales.

*Measurements.* The measurements in this study are well-known instruments developed in the Netherlands or translations of well-

known American originals. The original Dutch questionnaires are used in the Netherlands as important clinical instruments to measure relevant personality traits. The questionnaires have good psychometric qualities and have a large compilation of independently established validity indications. The following questionnaires were used.

(1) AAS (see studies one and two).

(2) Amsterdam Biographical Questionnaire (ABQ) [46]. This questionnaire provides scores for 3 personality traits: (1) neuroticism, (2) somatic neuroticism and (3) extroversion. The subscale somatic neuroticism provides scores for vague bodily sensations like sweating, stomach feelings and other somatic feelings referring to tension.

(3) Dutch Personality Inventory (DPI) [47]. This questionnaire is based upon the California Psychological Inventory and provides scores on the following 7 subscales: (1) inadequacy, (2) social inadequacy, (3) rigidity, (4) hostility, (5) self-sufficiency, (6) dominance and (7) self-esteem. Since it had been demonstrated before that the last 4 scales have unacceptable low reliability in the Dutch translation, only the first 3 scales were used.

(4) Dutch translation of the Adjective Check List (ACL) [48]. The ACL provides scores on 37 different personality traits. Although interpretation of the scores on this scale is not without problems (see the results paragraph), this questionnaire was still chosen because this scale is frequently used in clinical practices, and further, since it has been proven that this scale is valid, provides good clinical predictions in clinical descriptions. Correlations between ACL subscales and alexithymia could therefore result in a general clinical description of the alexithymic subject.

### Results

*Amsterdam Biographical Questionnaire.* The ABQ subscales neuroticism and somatic neuroticism did not

**Table 4.** Significant correlations between ACL subscales and the AAS

ACL subscale	Abbreviation	r	Two-tailed p value
Communality	(Com)	-0.23	≤0.001
Achievement	(Ach)	+0.15	= 0.002
Dominance	(Dom)	-0.19	≤0.001
Intraception	(Int)	-0.22	≤0.001
Nurturance	(Nur)	-0.23	≤0.001
Affiliation	(Aff)	-0.29	<0.001
Heterosexuality	(Het)	-0.41	≤0.001
Exhibition	(Exh)	-0.20	≤0.001
Aggression	(Agg)	-0.10	= 0.024
Change	(Cha)	-0.27	≤0.001
Deference	(Def)	+0.09	= 0.045
Counseling readiness males	(Crs.m.)	+0.25	≤0.001
Self-control	(S-Cn)	+0.24	≤0.001
Self-confidence	(S-Cfd)	-0.25	≤0.001
Personal adjustment	(P-Adj)	-0.19	<0.001
Ideal self	(Iss)	-0.12	= 0.011
Creative personality	(Cps)	-0.16	≤0.001
Military leader	(Mls)	-0.14	= 0.004
Feminine attributes	(Fem)	-0.39	≤0.001
Critical parent	(Cp)	-0.09	= 0.035
Free child	(FC)	-0.29	≤0.001
High origence/low intellectence	(A-1)	-0.19	≤0.001
High origence/high intellectence	(A-2)	-0.19	≤0.001
Low origence/low intellectence	(A-3)	-0.26	≤0.001
Low origence/high intellectence	(A-4)	-0.11	= 0.020

correlate significantly with scores for alexithymia as measured by the AAS (respective correlations:  $r = -0.03$ , n.s. and  $r = 0.04$ , n.s.), while the ABQ subscale extroversion correlated significantly and negatively with alexithymia ( $r = -0.22$ ,  $p = 0.001$ ).

*Dutch Personality Inventory.* Scores on the AAS correlated significantly positively with scores for social inadequacy and not at all with inadequacy and rigidity (respective correlations 0.18,  $p \leq 0.001$ , 0.02, n.s. and 0.02, n.s.)

*Adjective Check List.* Scores on 25 ACL subscales correlated significantly with AAS alexithymia scores. These correlations are presented in table 4.

The results with the ACL are not easily comprehended. Firstly, the scores on the AAS correlate significantly with 25 of the 37 ACL subscales. Secondly, the ACL subscales are not independent scales, since the various items load on several subscales. Thirdly, the ACL manual provides definitions for some scales, but not for others. Fourthly, although the manual gives a description for every subscale, these descriptions are not unambiguous. However, the ACL manual provides 2 lists of statements for every

subscale, which describe either the low- or high-scoring individual. Since the ACL scales are not independent, most of these statements are part of the descriptions of more than 1 subscale. Many statements of various descriptions, although not exactly alike, still have important features in common. In order to get a good impression about which personality features are related to alexithymia, we have clustered the statements of the descriptions concerned (descriptions of the high-scoring person in case of positive significant correlation with alexithymia and the descriptions for the low-scoring person in case of negative correlation with alexithymia), which share the same feature together. This analysis is presented below. To avoid clusters which are only very vaguely related to alexithymia, only those clusters are presented which are supported by at least 2 ACL subscales whose correlations with alexithymia had a corresponding p value of 0.001 or less.

(1) Alexithymia is associated with flatness of affect, which is part of the descriptions in the ACL subscales: Exh\*; Cha; S-Cn; Cps and FC (\* for full ACL subscale names, see table 4).

(2) Alexithymia is associated with a tendency to restrict oneself to an intellectual and cognitive approach and to be interested in prosaic issues, which is part of the descriptions in the ACL subscales: Int; Aff; Het; Fem; A-1; A-3.

(3) Alexithymia is associated with the impression of higher intellectual capacities and unusual ways of thinking, which is part of the descriptions in the ACL subscales: Aff; A-3, A-4.

(4) Alexithymia is associated with a tendency to social isolation and fear or mistrust of others, which is part of the descriptions in the ACL subscales: Com; Dom; Nur; Aff; Het; Exh; Crs.m.; S-Cn; S-Cfd; P-Adj; Mls; Fem; FC; A-3.

(5) Alexithymia is associated with a tendency to be autonomous and value independence, which is part of the descriptions in the ACL subscales: Nur; Aff; Het; Exh; Def; Fem; A-1; A-2; A-3.

(6) Alexithymia is associated with a tendency to avoid stress and with an inability to cope with stress, which is part of the descriptions in the ACL subscales: Dom; Int; Nur; Het; Cha; Def; S-Cn; S-Cfd; P-Adj; Iss; Cps; S-Cfd; A-2; A-3.

(7) Alexithymia is associated with a tendency to ruminate and to be concerned with oneself as an object, which is part of the descriptions in the ACL subscales: Ach; Dom; Aff; Crs.m.; S-Cfd; P-Adj; Iss; A-3.

(8) Alexithymia is associated with a tendency to be destructive and self-destructive, which is part of the descriptions in the ACL subscales: Com; Ach; Int; Nur; Aff; Het; S-Cfd; P-Adj; Iss; Mls; Fem; A-3.

(9) Alexithymia is associated with a tendency to over-control, to neglect needs and impulses and to delay gratification, which is part of the descriptions in the ACL subscales: Het; Exh; Agg; Cha; Def; S-Cn; Cps; FC; A-1; A-2.

(10) Alexithymia is associated with the tendency to experience a lack of personal meaning in life, and to feel cheated by life, which is part of the descriptions in the ACL subscales: Dom; Int; Aff; Het; Exh; Crs.m.; S-Cfd; P-Adj; Iss; FC; A-3.

(11) Alexithymia is associated with a tendency to avoid commitment and to delay action, which is part of the descriptions in the ACL subscales: Ach; Dom; Def; Crs.m.; S-Cfd; P-Adj; Iss; Cps; FC.

(12) Alexithymia is associated with a tendency to be submissive, which is part of the descriptions in the ACL subscales: Dom; Exh; Agg; Def; S-Cn; Iss; Cps.

(13) Alexithymia is associated with being dependable and responsible, which is part of the descriptions in the ACL subscales: Exh; Agg; Cha; Def; S-Cn; A-1; A-2.

(14) Alexithymia is associated with a tendency to conservatism, which is part of the descriptions in the ACL subscales: Exh; Cha; Def; S-Cn; Cps; A-2.

(15) Alexithymia is associated with a tendency to behave rigidly in social situations, which is part of the descriptions in the ACL subscales: Het; Cps.

## General Discussion

### *Factor Structure of the AAS*

The results of the factor analyses illustrated that the items of the AAS clearly load on 5 factors, and that the factor loadings are stable. The various AAS factors correspond clearly with the 5 most important features of alexithymia: difficulties with experiencing emotional feelings, difficulties with verbalizing emotions, difficulties with differentiating emotions, difficulties with analyzing emotions and difficulties with fantasizing. The alexithymic features covered by the AAS are therefore in line with the descriptions of alexithymia as presented in Taylor et al. [27] and Hendryx et al. [43].

### *Correlations between Subscales*

As could be expected on the basis of the almost perfect factor structure results, only weak correlations between the subscales were found (mean absolute correlation 0.16). However, the correlations between the subscales differentiating and verbalizing emotions (0.38 in the first study and 0.32 in the second) and those between experiencing and fantasizing (0.24 and 0.37) are still substantial. This suggests that these features are, although the composing items load on 1 factor only, still related to one another.

### *The Reliability of the AAS*

The reliability of the scale turned out to be 0.70 in the first study and 0.72 in the second study. Although not perfect, this reliability is clearly within the range accepted for personality scales, and certainly does not contrast unfavorably when compared with other alexithymia scales [5]. Further, it should be remembered that the scale consists of 20 items which are evenly distributed over 5 more or less independent factors. Although this has the advantage that the various components of alexithymia contribute evenly to the sum score, it has the disadvantage that Cronbach alpha results in an underestimation of the reliability.

The reliability for the subscales varied between 0.83 and 0.49, indicating that the internal consistency of some

of the subscales (difficulties in differentiating, analyzing and experiencing emotions) are below the standard of 0.70. Improvement in these subscales is therefore necessary if one wants to use these subscales separately, as for instance in clinical use, in order to see which alexithymia feature is most prominent for a particular person.

#### *Sex Differences in AAS Scores*

The mean scores on the AAS for males were slightly higher (0.18 SD in the first study and 0.2 SD in the second) compared to those for females. Testing these differences provided a result in the first study which approached significance and a clearly significant result in the second study. These results indicate that although there is a relationship between sex and alexithymia, as measured by the AAS, gender is only a minor factor. This result fits with the report of Noël and Rimé [49], who have analyzed the concerning literature. Their analysis indicated that of the 8 studies published, only 3 reported significant differences in mean alexithymia scores between males and females, 2 of these 3 studies reported lower mean scores for females and 1 lower mean scores for males, leaving no other conclusion open than that there is no or at the most only a very small sex factor in alexithymia.

#### *Correlations with Intellectual Abilities*

All correlations with intellectual abilities were extremely low and insignificant, explaining at the most only 1% of the variance. It follows that alexithymia as measured by the AAS correlates neither with verbal nor with nonverbal intelligence. Further, since the standard deviations in the scores for intellectual abilities were high when compared to the mean scores, it has to be concluded that intelligence is not a factor of any importance in alexithymia as measured by the AAS.

#### *AAS Scores in Various Populations*

The scores for alexithymia turned out to be significantly lower in the group of academy of dramatic art students and significantly higher in the group of math and artificial intelligence students when compared to the psychology students. These results can therefore be considered as an indication of the validity of the AAS. This suggestion is further substantiated by the correlations between AAS scores and scores for other personality traits, which are in line with those found with other alexithymia scales or which fit in with the general description of alexithymic features (see below).

The percentages of males and females differed among the three groups of students participating in this study. Therefore, one could assume that the differences between groups in mean alexithymia scores have to be explained by the differences in sex ratios. However, as described above, there is only a very small relation between sex and alexithymia, in the sense that males score slightly higher than females. Secondly, assuming that differences between groups as found in this study are the result of differences in sex ratios, then it has to be expected that the mean alexithymia score for drama students (50% males) would be higher than for psychology students (36% males), and we have found just the opposite. Finally, testing the scores of the math and artificial intelligence students (84% males) against the scores of the male psychology students only still provided a highly significant result (t value 4.23, corresponding p value of  $\leq 0.001$ ), demonstrating that the differences between groups may not be ascribed to differences in sex ratios.

#### *Correlations between AAS and other Personality Scales*

Although various significant correlations were found, most of these significant correlations were still rather low. It should, however, be kept in mind that the reliability coefficients are only moderately high for most personality scales. Therefore, high correlations may not be expected [50].

#### *ABQ and DPI*

The correlations, calculated between the AAS and the ABQ subscales provided two clearly insignificant correlations and one significant correlation. The extremely low correlations between alexithymia and neuroticism and somatic neuroticism indicate that alexithymia and neuroticism are independent personality traits. This conclusion is in line with the results in Vingerhoets et al. [42] and corresponds with Sifneos who already in 1973 had stressed the difference between neuroticism and alexithymia.

The significant negative correlation with extroversion has been described before [51] and is not surprising. Emotional experiences are the basis on which we judge and assess the motivations and behavior of others. Through lack of full emotional experiences, the alexithymic person will be in continuous doubt about the motivation of others, and this will block an outgoing attitude. This also explains the significant correlation between alexithymia and social inadequacy, as measured by aid of the DPI. The fact that the correlation between scores on the AAS and the DPI subscale inadequacy turned out to be ex-



tremely low indicates that in alexithymic persons, the tendency to feel inadequate is limited to social situations. These results are in line with those in Prince and Berenbaum [52] demonstrating that alexithymia is associated with social anhedonia, but not with nonsocial anhedonia, and with Krystal [6], who reports that alexithymics often function very successfully in their work.

Finally, the also extremely low correlation with DPI rigidity indicates that this personality feature is not part of the alexithymia syndrome.

#### *Adjective Check List*

The ACL results (1, 2 and 3) indicated that alexithymia is associated with flatness of affect, a tendency to restrict oneself to an intellectual and cognitive approach, interest in prosaic issues and with the impression of higher intellectual capacities.

It is not surprising that alexithymia is associated with flatness of affect, since this is assumed to be an important feature of alexithymia [27, 53], and further negative correlations between alexithymia and hedonic capacity have been described before [52]. The flatness of affect could also explain very well the association between alexithymia and the tendency to restrict oneself to an intellectual and cognitive approach and interests in prosaic issues, as well as the association between alexithymia and the impression of higher intellectual capacities, as found in this study. Furthermore, interest in prosaic issues, which is not measured directly by our scale, is part of the 'pensée opératoire' first described in Marty and M'Uzan [54], and which is, according to several authors, part of the alexithymia syndrome [53, 55, 56].

The ACL results (4, 5, 6 and 7) indicated that alexithymia is associated with a tendency to social isolation, to fear or mistrust of others, to be autonomous, to value independence, to avoid stress, to be unable to cope with stress, to ruminate and to be concerned with oneself as an object. Since one assesses the motivations of others by aid of one's own emotional experiences, and further, since alexithymic persons lack a full emotional experience, it has to be assumed that alexithymic persons are less able to assess the motivations of others. It is therefore not surprising that alexithymia is associated with a tendency to social isolation and mistrust of others. The relationship between alexithymia and social isolation has been described before in Wise et al. [57] and Kauhanen et al. [58].

The tendency of alexithymic persons to be autonomous and to value independence, as found in this study, could very well be the other side of the coin of social isolation and mistrust. The inability to assess motivations

of others could also explain the reduced capacity of alexithymic persons to cope with difficult situations as demonstrated in this study. In addition, alexithymic persons mostly do not express their emotions behaviorally [59, 60], or communicate their emotions in any other way [52], therefore, other persons in their social environment will not receive any signals that they have to change their stress-inducing behavior. Finally, negative correlations between alexithymia and ability to cope have been described before [42]. Furthermore, the lack of understanding concerning their own emotions and those of others could also explain the association between alexithymia and the tendency to ruminate and to be introspective in a particular way, as has been found in this study.

ACL result (8) indicated that alexithymia is associated with a tendency to be (self-) destructive. Prince and Berenbaum [52] demonstrated that alexithymia is associated with feeling unsafe and insecure during childhood, together with growing up in homes in which there was little open communication. Such an environment will result in emotional neglect of the child and most probably induces 'seeking for attention in negative ways'; a tendency which may survive into adulthood.

ACL result (9) indicated that alexithymia is associated with a tendency to over-control, to neglect needs and impulses and to delay gratification.

This result has been previously described in Krystal [6] who reported not only that alexithymic persons are over-controlled, but also that this tendency is so strong in alexithymic persons that they make a robot-like impression. Further, given the inability to experience emotional feelings, neglect of need and impulses has to be expected in alexithymic persons. Our results, indicating that alexithymic persons have a tendency to neglect their needs, are in line with the results of Horton et al. [61], who demonstrated that these persons are less inclined to look for solace.

The ACL results (10 and 11) indicated that alexithymia is associated with a tendency to experience a lack of personal meaning in life, to feel cheated by life, to avoid commitment and to delay action. Emotional experiences are the source of delight or distress. Further, delight as well as distress are the most important sources of our personal motivations. Both emotional experiences and personal motivation are the things which give meaning to our life. Since the ability to experience emotions is seriously reduced in alexithymic persons, a lack of personal meaning in life has to be expected. Further, the lack of experiences of delight, distress and personal meaning in life

could explain the tendency of alexithymic persons to avoid commitment, as found in this study.

The ACL results (12, 13, 14, and 15) indicated that alexithymia is associated with a tendency to be submissive, to being dependable and responsible, to be conservative and to behave rigidly in social situations. Since, as argued above, the understanding of one's own emotions and motivations as well as those of others is seriously reduced in alexithymic persons, alexithymic persons will have trouble in evaluating and understanding the social rules. They will therefore be inclined to accept unconditionally the 'official social rules' or the social rules as they are presented to them by important others. This could explain why alexithymic persons tend to behave rigidly in a socially desirable way. The tendency of alexithymics to

social conformism, to behave 'super-adjusted' or to fit into the demands of the environment has also been described before [6, 39, 40, 62].

To summarize, the ACL results suggest that alexithymia is related with, not only flatness of affect, resulting in a neglect of own needs and impulses and a tendency to restrict oneself to intellectual and prosaic issues, but also with an incapability to understand social situations and adapt social rules to the specific situation of the moment. Due to these incapacities, the alexithymic persons seems to flee into social isolation, to follow the rules rigidly as they are presented to them, to be submissive, and to avoid commitment. Together, these tendencies result in an experience of lack of personal meaning in life.

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